

CHAIN DRIVEN ARTICULATED DOOR

FIELD OF THE INVENTION

The present invention relates to an articulated or  
5 rolling door and a drive system for opening and closing  
the door.

BACKGROUND OF THE INVENTION

Articulated doors are formed from a plurality of  
10 panels hingedly connected to one another. These types of  
doors are becoming more and more popular for many  
different uses. They are for example used to cover large  
openings to garages and warehouse spacing etc. They are  
further used as rear truck doors on large truck trailers.  
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In the past, articulated doors were typically made  
from wood or lightweight steel materials. More recently  
there have been developments with respect to plastic  
panels which have become particularly suitable for use in  
20 rolling door applications.

A conventional rolling door is provided with  
cables to opposite sides of the door. These cables are  
used to raise and lower the door. In many garage type  
25 setups an automatic control in the form of a bar secured  
to the roof of the garage and extending to the upper end  
of the door is used to provide automatic opening and  
closing of the door. These garage door controllers are  
further able to hold or lock the garage door in its  
30 closed position.

It is not known in the trucking industry to use  
the conventional automatic door opener for a truck  
trailer door. This is because of the overhead space  
35 limitations of the trailer. A conventional roll up truck  
trailer door is therefore manually operated and

necessitates a door lock for securing the door in its closed position.

**SUMMARY OF THE PRESENT INVENTION**

5       The present invention provides a door system based on a chain drive for opening and closing an articulated door. The system of the present invention is one which has numerous different applications including truck trailer applications. In these particular applications  
10      the truck trailer door can be opened and closed using a power drive without having space limitation concerns.

In particular, a door assembly of the present invention comprises an articulated door formed from a plurality of preferably plastic panels hingedly connected to one another. Each of the panels has an end fitting. The end fitting of the panels are pivotally linked with one another to form a chain to the side of the articulated door.  
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20      The assembly further includes a rotatable toothed gear which engages the chain formed by the end fittings for opening and closing the articulated. The toothed gear may be a power driven gear.

25      The above as well as other advantages and features of the present invention will be described in greater detail according to the preferred embodiments of the present invention in which;  
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Figure 1 is a perspective view of the rear of a truck trailer provided with an articulated door according to a preferred embodiment of the present invention;

35      Figure 2 is a perspective view of the ends of two

connected panels from the door of Figure 1;

Figure 3 is an exploded perspective view of one of  
the panel ends of Figure 2 fitted with a chain forming  
5 end fitting according to a preferred embodiment of the  
present invention;

Figure 4 is an exploded perspective view of the  
drive system for engaging the panel end fitting of Figure  
10 3; and

Figure 5 is a side view showing operation of the  
drive system of Figure 4.

15 **DETAILED DESCRIPTION ACCORDING TO THE PREFERRED  
EMBODIMENTS OF THE PRESENT INVENTION IN WHICH:**

Figure 1 shows a truck trailer 1 provided with a  
roll up articulated door generally indicated at 3. This  
door is formed from a plurality of door panels 5.

20 A pair of these panels secured to one another are  
shown in Figure 2 of the drawings. As will be seen  
according to this preferred embodiment each of the panels  
comprises a resin wall 6 surrounding an interior region  
25 of the panel. When the panels are initially formed this  
interior region is hollow and then preferably filled with  
a foam material 9.

30 The panels are all identical in construction with  
one another. Each panel includes a curved tail 11 at one  
end of the panel and a correspondingly shaped slot 13 at  
the other end of the panel. The tail of one panel fits  
into the slot of an adjacent panel to form a hinged joint  
between panels.

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Figure 3 of the drawings shows an end fitting

generally indicated at 15 which fits into the open end 7 of each of the panels 5. Preferably, there is an end fitting at each end of each panel.

5 End fitting 15 comprises a link part 17 provided with internal lugs 19 and spaces between the lugs. A roller 21 is rotatably trapped to one end of the link as shown in Figure 3.

10 Provided on the outside surface of link 17 is a cover plate 23 with a plug part 25 projecting from plate 23.

15 Like panel 5 end fitting 15 preferably has a resin base construction. The end fitting may be injection molded from a relatively hard durable plastic material such as nylon or the like. The panel on the other hand is preferably made in an extrusion or even a pultrusion process. Foam material 9 may be introduced to the 20 interior of panel 5 as the panel is being formed. The pultrusion process lends itself particularly well to formation of the panel while simultaneously injecting the foam into the interior of the panel.

25 End fitting 15 is mounted to panel 5 by pushing plug part 25 of the end fitting into the open end 7 of the panel. The plug portion will then embed itself into the foam material to secure the fitting with the panel end. Adhesives may also be used to assist in securing 30 the panel and the fittings to one another.

As an alternative method of securing the fitting with the panel, the plug part 25 of the fitting can be pushed into the open end of the panel before foaming. 35 The injected foam will then fill the hollow interior of plug part 25. The foam hardens within the plug part to

secure the end fitting with the panel.

Figures 4 and 5 of the drawings shows how a chain is formed by connecting end-to-end end fittings between the side by side connected panels of door 3. These figures also show how the chain engages with and is driven by a power drive system for opening and closing articulated door 3.

In Figure 4 it will seen that a plurality of end fittings 15 are pivotally connected at the rollers 21 to one another. The rollers align with the pivotal connections between the panels. The links 17 of these end fittings form a length of chain. Each of the end fittings is plug fitted into an aligned one of the panels 5 to secure the chain along the edge of the door.

A drive system generally indicated at 35 operates in conjunction with the chain formed by the end fittings to raise and lower door 3. This drive system comprises a rotary gear 39 having teeth 40. Teeth 40 and more particularly the gaps between teeth 40 engage the lugs 19 of the chain links 17.

Rotary gear 39 is attached to a second rotary gear 41 having teeth 42. The teeth 42 of gear 41 engage with correspondingly shaped teeth of a transfer gear 43. Transfer gear 43 is rotated by a power driven gear 45.

The chain formed by the panel end fittings is guided in its up and down travel by means of a track 31 mounted to the interior of the truck.

Figure 5 of the drawings shows the drive system as including a cable 51 having its one end 53 attached to gear 39. The other end of cable 51 is attached at 55 to

load biasing spring 57 secured at 59 to an inside surface of the truck body. The bias provided by spring 57 at the different up and down positions of the door is set to substantially offset weight of the door. As such the 5 power required to drive system 35 is minimal e.g., simply enough to overcome inertia in starting the door to move from a stopped position.

As earlier noted the door assembly of the present 10 invention will typically include a power drive system as described immediately above to both sides of the door for a balanced opening and closing of the door.

A further benefit provided by the power drive 15 system is that when the main drive gear 45 is not in operation it is locked against rotation. This in turn locks up the rest of the assembly which eliminates the need for any type of an external lock on the door. As can be seen with respect in Figure 1 door 3 does not include 20 an external door lock.

Although various preferred embodiments of the present invention have been described in detail, it will be appreciated by those skilled in the art that 25 variations may be made without departing from the spirit of the invention or the scope of the appended claims.